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(54) THIN WATERPROOF WORK LIGHT

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F21V 31/00	(2006.01)
F21V 17/16	(2006.01)

(52) **U.S. Cl.**

CPC ***F21V 15/01*** (2013.01); ***F21V 17/16*** (2013.01); ***F21V 31/005*** (2013.01)

(58) **Field of Classification Search**

CPC F21V 31/005; F21W 2111/10

See application file for complete search history.

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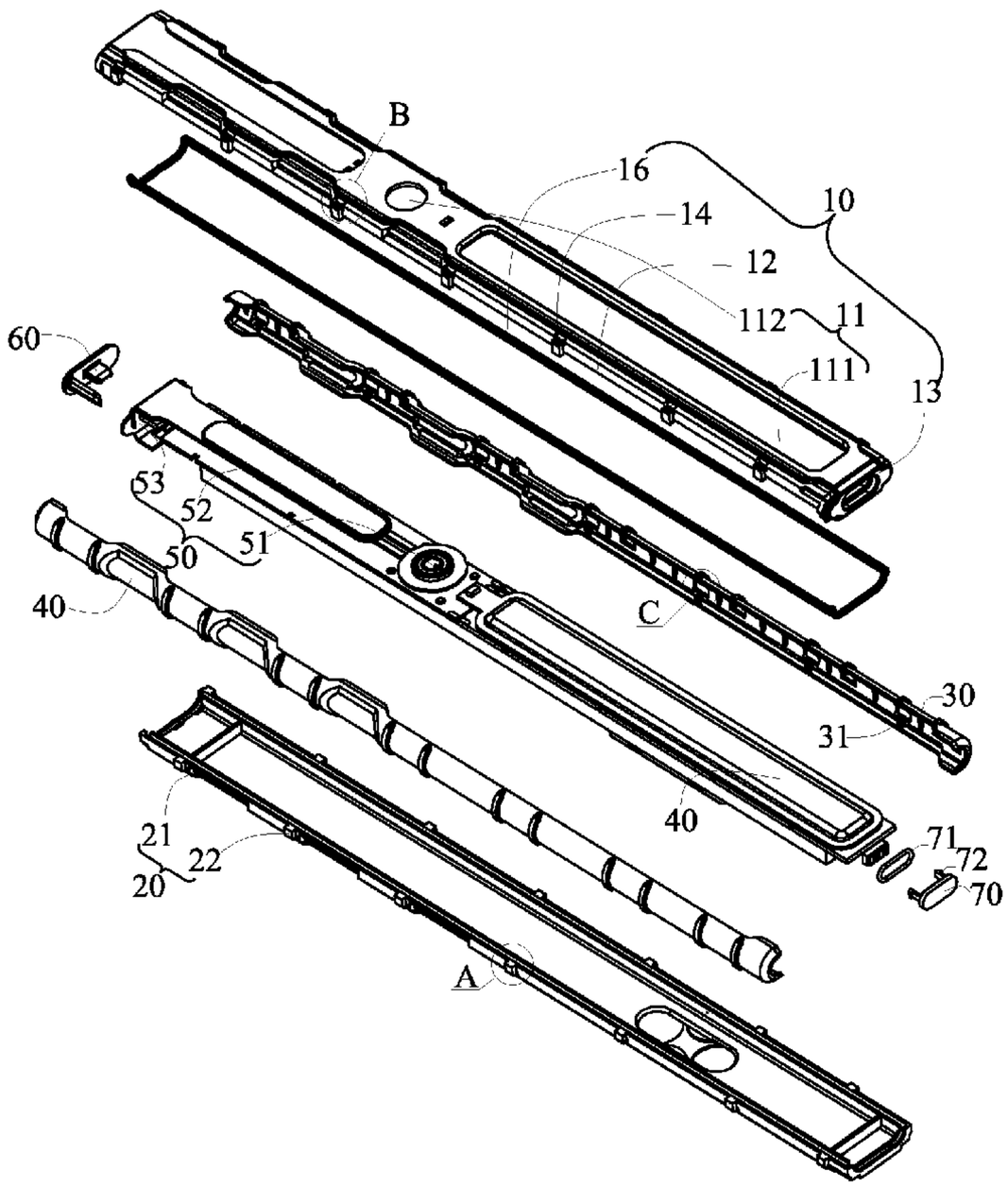
(57) **ABSTRACT**

A thin waterproof work light includes a bottom cover, a top cover, and two side bezels. The bottom cover includes two side walls, two end covers, a plurality of first locks, a first storage slot, and a sealing strip. Each of the first locks include a first body extending from the side wall along the longitudinal direction of the strip bottom cover, and a first clip extending from the first body. The top cover includes a second storage slot and a plurality of second locks. The sealing strip is clamped between the first and second storage slots. Each of the second locks includes a second body, and a second clip. Each of the side bezels includes a plurality of third locks. Each of the third locks includes a third body, and a third clip. The resulting joint created by assembling the covers with the sealing strip is rendered waterproof.

13 Claims, 6 Drawing Sheets



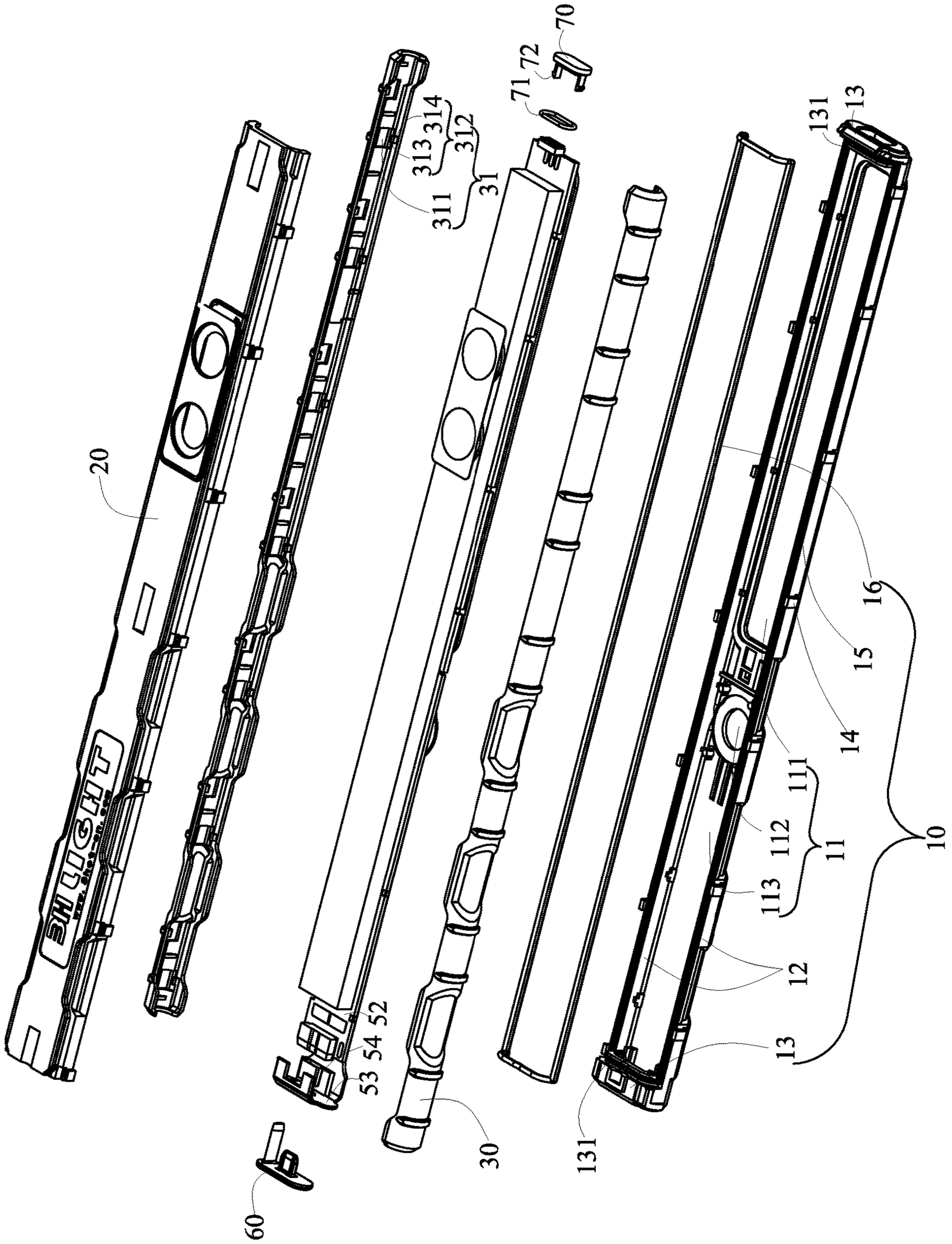

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FIG. 1

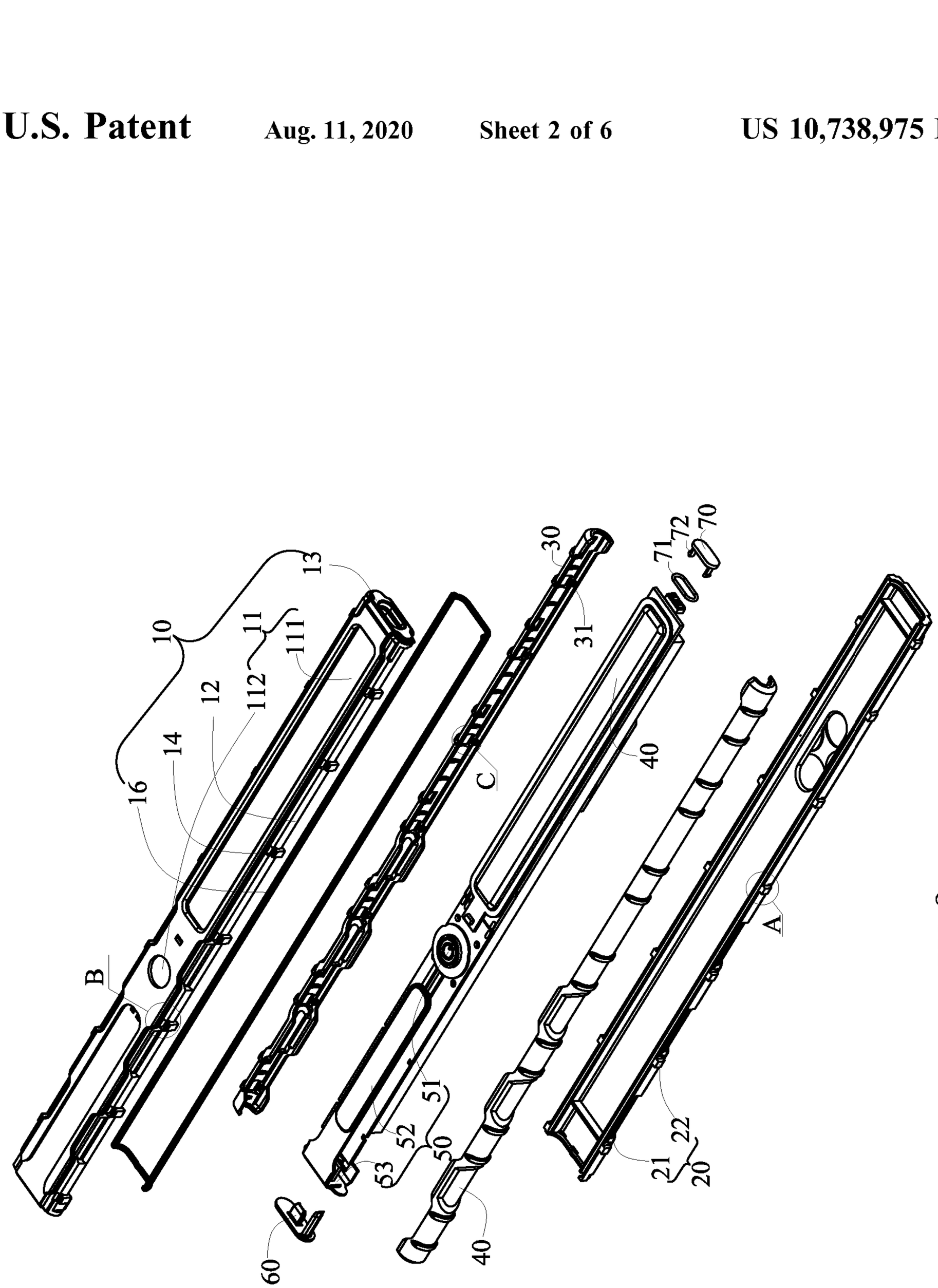

FIG. 2

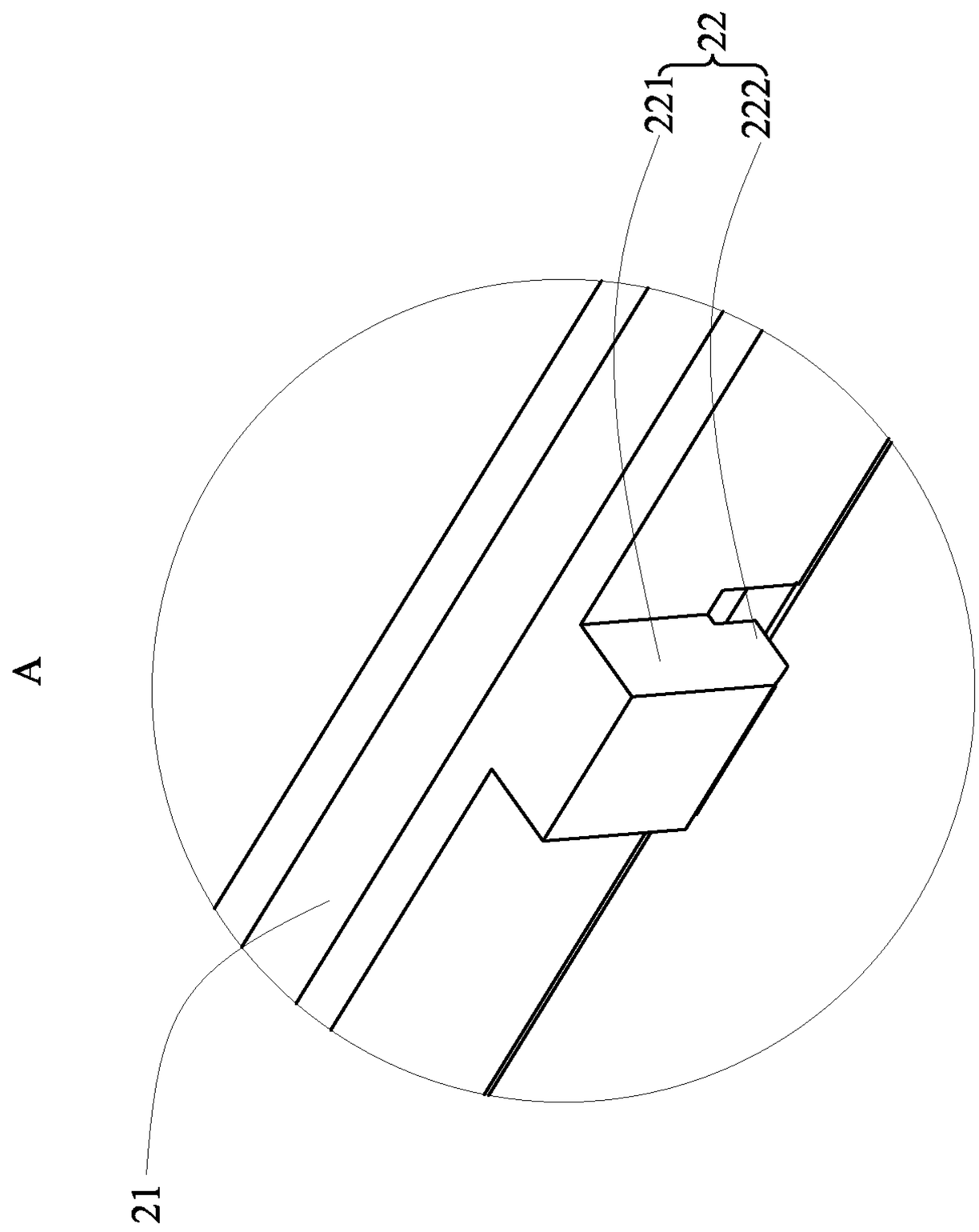

FIG. 3

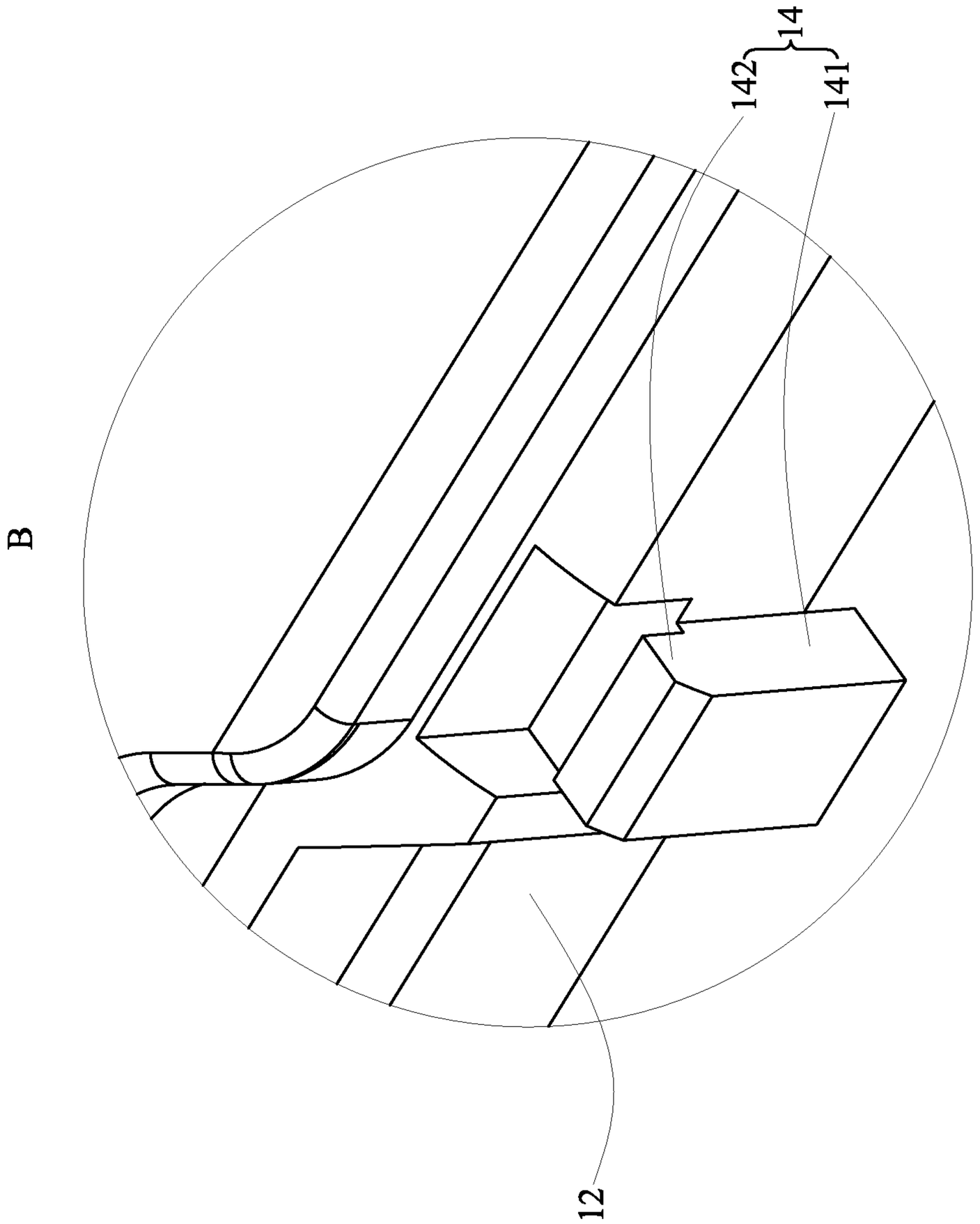

FIG. 4

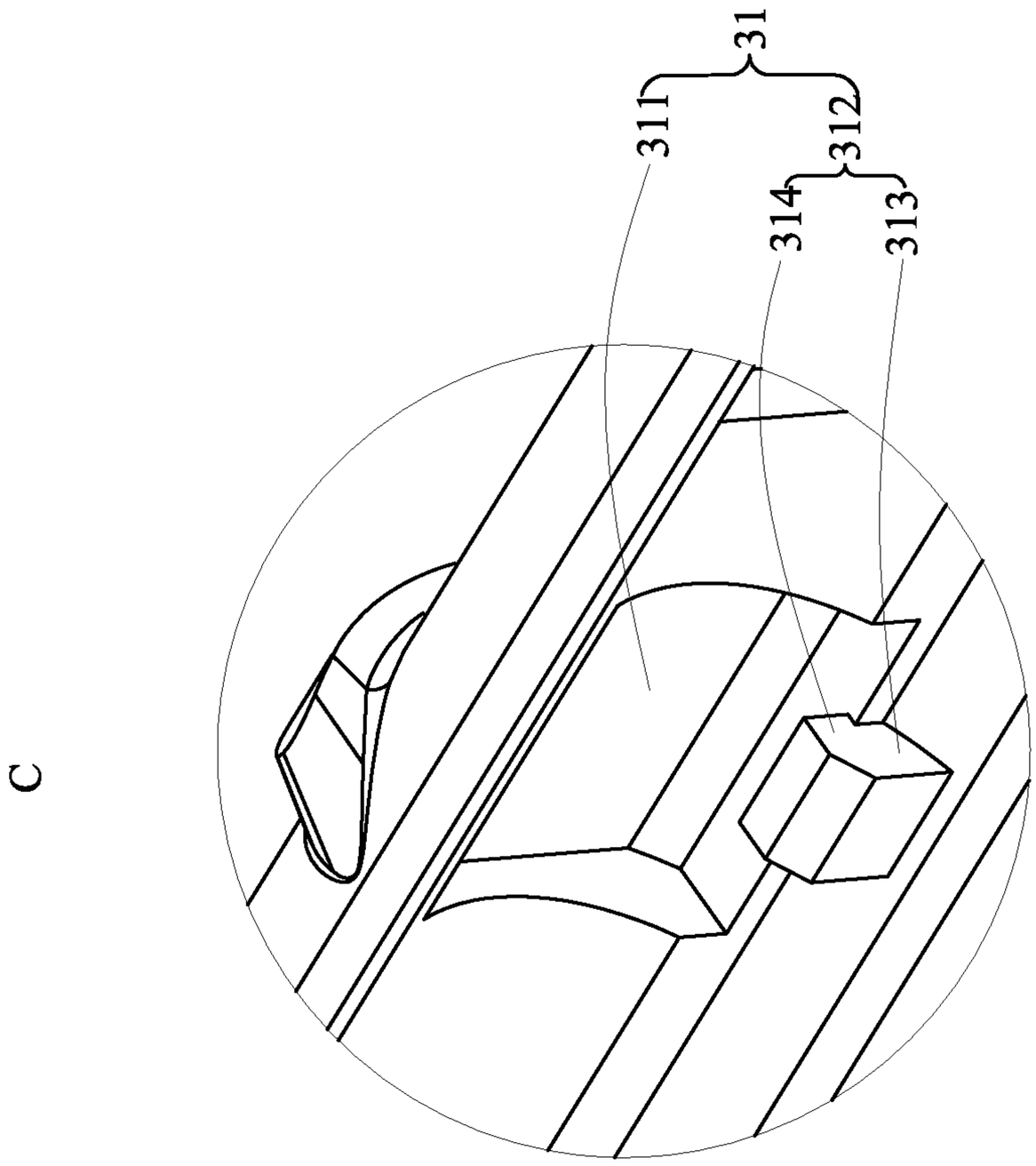

FIG. 5

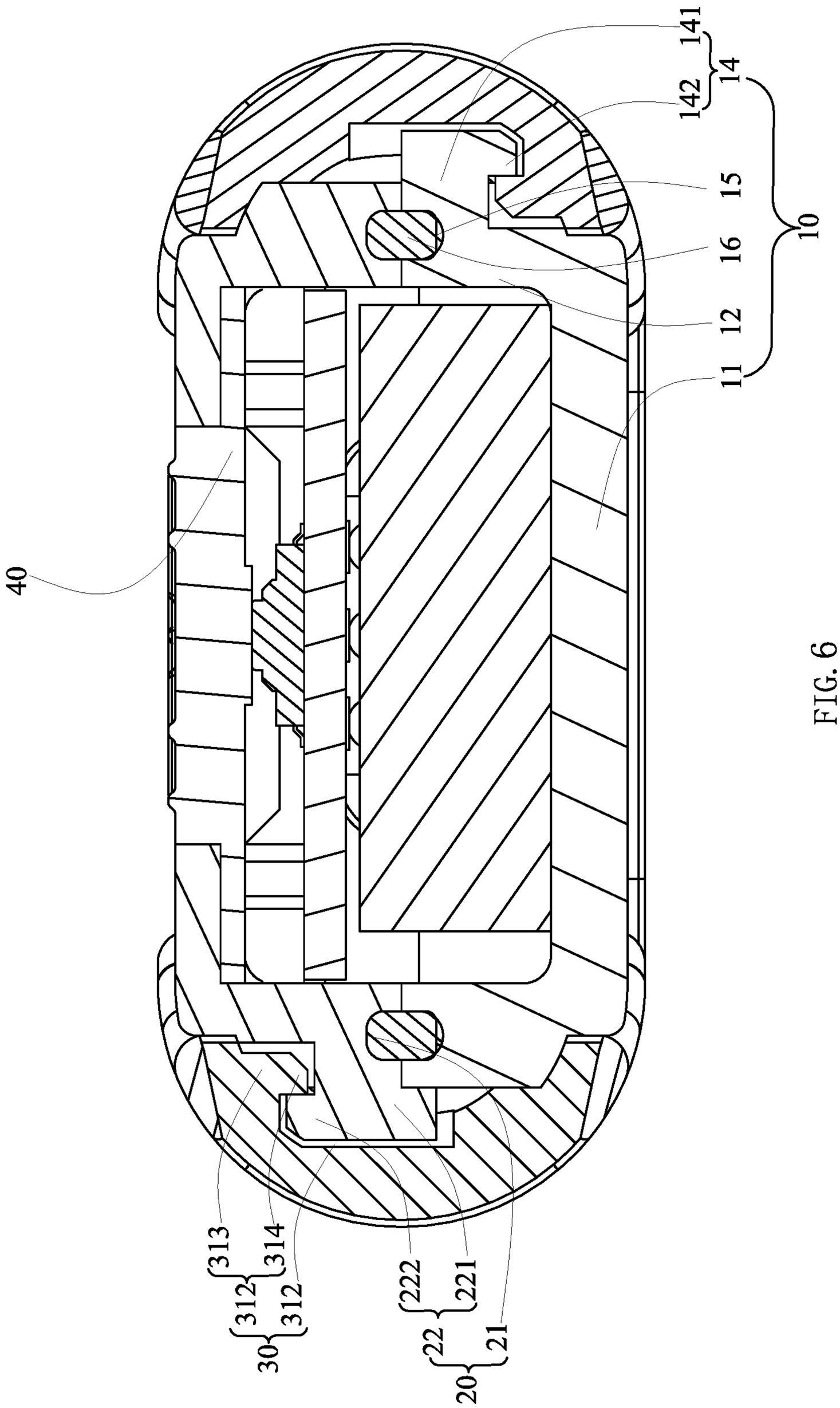

FIG. 6

THIN WATERPROOF WORK LIGHT

RELATED APPLICATION

This present application claims the benefit of the Chinese Application, CN201811588182.3, filed on Dec. 25, 2018, the entire specification of which is hereby incorporated by reference.

BACKGROUND

1. Technical Field

The present invention relates to a lighting device, and more particularly to a thin waterproof work light.

2. Description of the Related Art

In ordinary daily life, a general waterproof and dustproof light includes a lamp holder, lamp head, lamp cup, drive power, printed circuit board, light source, light transmitting component, cover, and more. A cover is fixed onto the lamp cup or lamp head by a screw, and the light transmitting component and the cover are pasted onto an inner side wall or step of the light cup. The connection between the cover and the lamp head can be loose. As a result, a short circuit may be caused by the entry of water vapor or moisture during waterproof testing, or unsightliness may be caused by entry of dust during dustproof testing. Therefore, the lamps cannot pass UL certification.

Moreover, a panel may be connected to the lamp cup by thread and the printed circuit board is fixed in the lamp cup by a screw and the cover is fixed onto the step of the lamp cup in some lamps. However, when a screw is used for connection and fixing instead of an elastic gasket, the connections among the lamp cup, the cover or the panel are not tight enough and water leakage easily occurs. Moreover, the necessary waterproof pad is also lacking in cover, further increasing the possibility of the lamp being short-circuited by moisture.

Therefore, it is necessary to provide a thin waterproof work light which solves the above problems.

BRIEF DESCRIPTION OF THE DRAWINGS

Many aspects of the embodiments can be better understood with references to the following drawings. The components in the drawings are not necessarily drawn to scale, the emphasis instead being placed upon clearly illustrating the principles of the embodiments. Moreover, in the drawings, like reference numerals designate corresponding parts throughout two views.

FIG. **1** is an exploded view of a thin waterproof work light according to an embodiment.

FIG. **2** is another exploded view of the thin waterproof work light of FIG. **1**.

FIG. **3** is a partially enlarged schematic view of the thin waterproof work light of FIG. **2** in inset A.

FIG. **4** is a partially enlarged schematic view of the thin waterproof work light of FIG. **2** in inset B.

FIG. **5** is a partially enlarged schematic view of the thin waterproof work light of FIG. **2** in inset C.

FIG. **6** is a sectional schematic view of the thin waterproof work light of FIG. **1**.

DETAILED DESCRIPTION

The present application is illustrated by way of example and not by way of limitaion in the figures of the accompanying drawings. It should be noted that references to "an" or "one" embodiment in this application are not necessarily to the same embodiment, and such references mean at least one.

Referring to FIG. **1** to FIG. **6**, a thin waterproof work light is shown in accordance with an exemplary embodiment of the present invention. The thin waterproof work light includes a strip bottom cover **10**, a strip top cover **20** covering the strip bottom cover **10**, two side bezels **30** fastened onto the strip bottom cover **10** and the strip top cover **20** along the longitudinal direction thereof, a light transmission plate **40** arranged on the strip bottom cover **10**, and a button module **50** disposed on the strip bottom cover **10** adjacent to the light transmission plate **40**. The thin waterproof work light may include other functional modules, such as a light source module arranged between the strip bottom cover **10** and the strip top cover **20**, power unit, switch unit, electrical connection assembly, and so on, which are well known by a person skilled in the art and not described in detail.

The strip bottom cover **10** may have a grooved structure and includes a bottom wall **11**, two side walls **12** arranged on two sides of the bottom wall **11**, two end covers **13** arranged along a longitudinal direction of the strip bottom cover **10**, a plurality of first locks **14** respectively disposed on the two side walls **12** and spaced apart from each other, a first storage slot **15** embedded in the two side walls **12** and capped by the two end covers **13** and arranged opposite the strip cover **20**, and a sealing strip **16** contained in the first storage slot **15**. The bottom wall **11**, side walls **12**, the end walls **13**, the first lock **14**, and the first storage slot **15** are integrally formed and injection molded from plastic. The grooved structure formed by the bottom wall **11**, the side walls **12**, and the end covers **13** is well known by a person skilled in the art and not described in detail. The bottom wall **11** includes a light transmission hole **111** configured for disposing the light plate **40**, a circular hole **112** separate from the light transmission hole **111**, and a holding channel **113** separate from the circular hole **112**. The structure, the sealing principle, and the structural relationship of the light transmission hole **111**, the circular hole **112**, and the holding channel **113** will be described in detail later with the light-transmitting plate **40** and the button module **50**. The light transmission hole **111**, the circular hole **112**, and the holding channel **113** are arranged along the longitudinal direction of the strip bottom cover **10**. The end cover **13** may be a step structure and includes a step portion **131**. The step portion **131** is configured for opening part of the first storage slot **15**. It is understood that each of the end covers **13** has a functional hole opened thereon, such as power hole, or data interface hole, and so on. In the present embodiment, one of the end covers **13** has a power hole opened therein and another has a data interface hole opened therein. The first locks **14** are disposed on outer sides of the two side walls **12** respectively and have the same structure. Therefore, only one of the first locks **14** is described in detail as an example. Referring to FIG. **4**, the first lock **14** includes a first body **141** extended outwardly from the side wall **12** of the strip bottom cover **10**, and a first clip **142** extended from the first body **141** and away from the strip top cover **20** so that the first clip **142** is spaced apart from the side wall **12** of the strip bottom cover **10**. The plurality of the first locks **14** are arranged along the longitudinal direction in interval. The operating principle of the first locks **14** will be described in detail later with the strip top cover **20** and the side bezels **30**. In order to match with the following second locks **22**, in a cross section perpendicular to the longitudinal direction of the

strip bottom cover **10**, only one first lock **14** intersects the cross section. That is to say, the first locks **14** disposed on the two side walls **12** are staggered along the longitudinal direction of the strip bottom cover **10**. The first storage slot **15** is a ring slot and has a cross-section shape of an arc, square, or U. In the present embodiment, the first storage slot **15** has a cross-section shape of U. When the first storage slot **15** has an arc-shaped cross-section, the central angle of the arc is less than or equal to 180 degrees. The sealing strip **16** is made of silicone and may have the same cross-section shape as that of the first storage slot **15**. As a result, the sealing strip **16** has a shape of U and fits tightly in the first storage slot **15**.

The strip top cover **20** may also be a grooved structure and is configured for matching with the side walls **12** and the end covers **13**. The strip top cover **20** includes a second storage slot **21**, and a plurality of second locks **22** spaced apart from each other. The strip top cover **20** is a through groove along the longitudinal direction thereof and an end of the strip top cover **20** is directly covered onto the step portion **131**. As a result, the cross-section shape of the strip top cover **20** should have the same shape as that of the step portion **131** so as to interface with the step portion **131**. The second storage slot **21** has the same structure and cross-section shape as that of the first storage slot **15** and has the cross-section shape of U and interfaces with the sealing strip **16**. When the strip top cover **20** covers the strip bottom cover **10**, the second storage slot **21** will contain part of the sealing strip **16** which is exposed out of the first storage slot **15**. Moreover, as the sealing strip **16** is tightly fit in the first and second storage slots **15** and **22**, and when the strip bottom cover **10** and the strip top cover **20** are tightly clamped by the two side bezels **30**, the sealing strip **16** will be deformed. This achieves the stated objective of preventing water from entering between the joint seam formed by the strip top cover **20** and the strip bottom cover **10**. Each of the second locks **22** has almost the same structure and working principle as the first locks **14** and include a second body **221** and a second clip **222** extending from the first lock **221**. The second clip **222** is spaced apart from the side wall of the strip top cover **20**. One difference between the first clip **142** and the second clip **222** is that the second clip **222** extends away from the strip bottom cover **10**. As a result, the extending direction of the second clip **222** is opposite to that of the first clip **142**. In a cross section perpendicular to the longitudinal direction of the strip bottom cover **10**, only one second lock **22** intersects with the cross section. That is to say, the second locks **22** are staggered along the lengthwise direction of the strip bottom cover **10**. The operation of the first and second locks **14**, **22** in this manner will be described in detail below in conjunction with the third lock **312** described below.

The two side bezels **30** have the same structure and shape. Therefore, only one side bezel **30** is described in detail as an example. A cross-section shape of the side bezel **30** may be an arc or a square which should match with the strip bottom cover **10** and the strip top cover **20**. In the present embodiment, the side bezel **30** has a cross-section shape of an arc. The side bezel **30** has a plurality of locking connection parts **31**. The plurality of the locking connection parts **31** are arranged along the longitudinal direction of the strip bottom cover **10** and respectively correspond to each of the first and second locks **14**, **22** so as to respectively engage with the first and second locks **14**, **22** to lock and fix the relative position between the strip bottom cover **10** and the strip top cover **20**. In the present embodiment, only one locking connection part **31** is described in detail to explain the structure and working principle thereof. The locking connection part **31** includes a concavity **311**, and a third lock **312** disposed on the side wall of the concavity **311**. Since the locking connection part **31** is configured for matching with the first and second locks **14**, **22** to engage therewith, the third lock **312** includes a third body **313**, and a third clip **314** extends from the third body **313**. The position of the third body **313** is related to that of the first and second locks **14**, **22**, that is, the positions of the first and second latches **14**, **22** corresponds to that of the third body **313**. The extending direction of the third clip **314** is also related respectively to that of the first and second clips **142**, **222** of the corresponding first and second locks **14**, **22**. That is to say, the extending direction of one of the third clips **314** is opposite to that of one of the first and second clips **142**, **222**. When the side bezel **30** is locked onto the strip bottom cover **10** and the strip top cover **20**, the third clips **314** are respectively inserted into the gap between the first clip **142** and the strip bottom cover **10** or the second clip **222** and the strip top cover **20**. Moreover, as the extending direction of the first clip **142** is opposite to that of the second clip **222**, the strip bottom cover **10** and the strip top cover **20** can be tightly locked together. The largest distance between the first clip **142** and the second clip **222** should be equal to or less than that of the two third clips **314** which are adjacent to each other and have opposite extension directions along the longitudinal directions of the strip bottom cover **10** and the strip top cover **20** so as to tightly lock the strip top cover **20** onto the strip bottom cover **10** and deform the sealing strip **16**. Furthermore, for a cross section passing through any one of the first locks **14** and perpendicular to the longitudinal direction of the strip bottom cover **10**, the cross section will pass through the second lock **22** so as that the direction of the force between the first lock **14** and the second lock **22** is parallel to the longitudinal direction of the strip bottom cover **10** and the strip top cover **20**. As a result, when the sealing strip **16** is pressed, the strip bottom cover **10** or the strip top cover **20** are prevented from being separated against the intended direction of assembly, which prevents a waterproofing failure. Moreover, as described above, in a cross section perpendicular to the longitudinal direction of the strip bottom cover **10**, only one of the first and second **14**, **22** intersects with the cross section. As a result, when the third locks **312** are engaged with the first lock **14** or the second lock **22**, the third lock **312** provides locking force on both sides of the strip bottom cover **10** or the strip top cover **20** so as to avoid excessive accumulation of mechanical fatigue due to having too many components, which may cause waterproofing failure.

When the strip bottom cover **10** and the strip top cover **20** are tightly locked together, the sealing strip **16** is also pressured tightly between the first and second storage slot **15**, **21**. As a result, the purpose of sealing the joint of the strip bottom cover **10** and the strip top cover **20** is achieved. Moreover, the height of the side bezel **30** is larger than that of the strip bottom cover **10** and the strip top cover **20** along the longitudinal direction thereof so as that when the thin waterproof work light is accidentally dropped, the side bezel **30** strikes the ground first, and since the side bezel **30** is made of a soft material such as silicone, the side bezel **30** can serve a cushioning function, thereby improving anti-shock and anti-drop performance of the thin waterproof work light.

The light transmission plate **40** covers the light transmission hole **111** of the strip bottom cover **10**. The light transmission hole **111** may include a step in a section which is perpendicular to the longitudinal direction of the strip bottom cover **10**. The light transmission plate **40** is arranged onto the step of the light transmission hole **111**, specifically,

the light transmission plate **40** adheres to the light-transmitting hole **111** by a waterproof glue to achieve waterproofing.

The button module **50** may be made of soft material such as silicone or rubber. The button module **50** includes a pressing portion **51**, a connecting portion **52** connected to the pressing portion **51**, and a flexible end portion **53** connected to the connecting portion **52**. The pressing portion **51** is inserted into the circular hole **112** of the strip bottom cover **10**. Specifically, the edge of the pressing portion **51** adheres to the circular hole **112** by a waterproof glue to achieve waterproofing. The connecting portion **52** is contained in the holding channel **113** so as to conserve space and fix the button module **50** in place. The flexible end portion **53** covers the step portion **131** of the end cover **13**. The flexible end portion **53** has a through hole **54** opened thereon and the through hole **54** is configured for providing a passage for inserting the source plug or another function plug. Specifically, the thin waterproof work light further includes a waterproof stopper **60**. The waterproof stopper **60** has the same cross-section shape as the through hole **54**. However, the cross-sectional area of the waterproof stopper **60** may be slightly smaller than the cross-sectional area of the through hole **54**. The waterproof plug **60** is inserted into the function hole of the end cover **13** when the function hole on the end cover **13** is not necessary for waterproofing or dustproofing the work light.

For another function hole of the end cover **13**, the thin waterproof work light further includes a sealing stopper **70** and a sealing ring **71** wrapped onto the sealing stopper **70**. The sealing stopper **70** has two barbs **72** set thereon and the sealing ring **72** wraps onto the two barbs **72**. When the two barbs **72** are inserted into the function hole of the end cover **13** and hooked on the end cover **13**, the sealing ring **71** is clamped between the sealing stopper **70** and the end cover **13** so as to waterproof and dustproof the work light.

As described above, the thin waterproof work light has the special waterproof structure of the strip bottom cover **10** and the strip top cover **20**, specifically, the first storage slot **15** is opened on the strip bottom cover **10**, the second storage slot **21** is opened on the strip top cover **20** and the sealing strip **16** is tightly clamped between the first and second storage slots **15**, **21** and is deformed. Therefore, when the strip bottom cover **10** and the strip top cover **20** are tightly locked, the resulting joint formed by the strip bottom cover **10** and the strip top cover **20** is made waterproof. Moreover, in order to tightly press the strip bottom cover **10** onto the strip top cover **20** without increasing the length of the strip bottom cover **10** and the strip top cover **20** in the assembly direction thereof, the first and second locks **14**, **22** are respectively arranged on the side wall of the strip bottom cover **10** and the strip top cover **20** and the first and second clips **142**, **222** have opposite directions of protrusion. And, the first and second locks **14**, **22** are tightly locked together using the third lock **312**. Since the first, second and third locks **14**, **22**, **312** are disposed on the side walls of the thin waterproof work light, the thickness of the thin waterproof light will not increase. As a result, the strip bottom cover **10** and the strip top cover **20** can be tightly locked together to form a waterproof and dustproof device without increasing the thickness of the work light, thereby making the thin waterproof work light as thin as possible.

While the disclosure has been described by way of example and in terms of exemplary embodiment, it is to be understood that the disclosure is not limited thereto. On the contrary, it is intended to encompass various modifications and similar arrangements (as would be apparent to those skilled in the art). Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications and similar arrangements.

What is claimed is:

1. A thin waterproof work light, comprising:

a strip bottom cover, the strip bottom cover comprising two side walls spaced apart from each other, two end covers arranged respectively on two ends of the two side walls along a longitudinal direction thereof, a plurality of first locks disposed at regular intervals on each of the two side walls and spaced apart from each other, a first storage slot embedded in each of the two side walls and capped by the two end covers, and a sealing strip contained in the first storage slot;

a strip top cover covering the strip bottom cover, the strip top cover comprising a second storage slot corresponding to the first storage slot, and a plurality of second locks spaced apart from each other at regular intervals on the strip top cover; and

two side bezels configured for locking the strip bottom cover and the strip top cover, each of the side bezels comprising a plurality of third locks arranged along the longitudinal direction of the strip bottom cover;

wherein each of the first locks comprises a first body protruding from one of the two side walls and each first lock has a first clip protruding from the first body, each first clip extending away from the strip top cover;

each of the second locks comprises a second body and each second lock has a second clip protruding from the second body, each second clip extending away from the strip bottom cover;

each of the third locks corresponds to an opposite first lock or second lock and comprises a third body and each third lock has a third clip protruding from the third body, each third clip protruding in a direction opposite the extending directions of the corresponding first clip or the corresponding second clip;

the sealing strip is a ring;

the first storage slot being uncovered in the direction of the strip top cover, and the sealing strip is clamped between the first storage slot and the second storage slot.

2. The thin waterproof work light as claimed in claim **1**, wherein the first clip does not touch the side wall of the strip bottom cover, and the third clip is inserted between the first clip and the side wall.

3. The thin waterproof work light as claimed in claim **1**, wherein the second clip does not touch the strip top cover, and the third clip is inserted between the second clip and the strip top cover.

4. The thin waterproof work light as claimed in claim **1**, wherein cross-sectional shapes of the first and second storage slots are arcs, center angles of the arcs being less than or equal to 180 degrees.

5. The thin waterproof work light as claimed in claim **1**, wherein in a cross section perpendicular to the longitudinal direction of the strip bottom cover, only one first lock intersects the cross section.

6. The thin waterproof work light as claimed in claim **1**, wherein in a cross section perpendicular to the longitudinal direction of the strip bottom cover, only one second lock intersects the cross section.

7. The thin waterproof work light as claimed in claim **1**, wherein in a cross section perpendicular to the longitudinal direction of the strip bottom cover and intersecting one of the first locks, the cross section also intersects with one of the second locks.

8. The thin waterproof work light as claimed in claim 1, wherein each side bezel comprises a plurality of locking connection parts, each of the locking connection parts comprises a concavity, the third lock is disposed on one side of the concavity.

9. The thin waterproof work light as claimed in claim 1, wherein each of the end covers contains a step portion into which the first storage slot extends, and in a cross section perpendicular to the longitudinal direction of the strip bottom cover, a cross-sectional shape of the step portion is identical to that of the strip top cover.

10. The thin waterproof work light as claimed in claim 1, wherein a largest distance between the first clip and the second clip is equal to or less than a distance between two sequential third clips which are adjacent to each other.

11. The thin waterproof work light as claimed in claim 1, wherein the strip bottom cover further comprises a bottom wall disposed between the two side walls, a light transmission opening in the bottom wall, a holding channel in the bottom wall, and a circular hole in the bottom wall between, wherein the circular hole is located between the light transmission opening and the holding channel, and the light transmission opening, the holding channel, and the circular hole are separate from each other.

12. The thin waterproof work light as claimed in claim 11, further comprising a light transmission plate attached to the light transmission opening in the bottom wall of the strip bottom cover by a waterproof glue.

13. The thin waterproof work light as claimed in claim 11, further comprising a button assembly attached to the strip bottom cover, wherein the button assembly comprises:

a pressing portion having a circular rim,

a connecting portion connected to the pressing portion, and

a flexible end portion connected to the connecting portion, the flexible end portion having a through hole for connecting a functional plug to the pressing portion,

wherein the circular rim of the pressing portion is connected to the circular hole of the bottom wall,

the connecting portion is disposed in the holding channel of the bottom wall to fix the button assembly in place, and

the flexible end portion covering one of the end covers.

* * * * *